What is claimed is:

1. An image processing device for processing an original image including multiple pixels to create a new image, each of the multiple pixels having a pixel value, the device comprising:

an extracting unit extracting, from multiple pixel values of multiple pixels, an original pixel value of a subject pixel and pixel values of surrounding pixels that are positioned to surround the subject pixel, the subject pixel and the surrounding pixels being arranged in a matrix configuration;

a first calculating unit calculating a differential vector for the subject pixel by performing a differential operation on the pixel values of the surrounding pixels and calculating a vector magnitude of the differential vector and a vector direction of the differential vector;

a second calculating unit calculating a new pixel value of the subject pixel based on the original pixel value of the subject pixel, a value determined dependently on the vector magnitude, and a pixel value of an adjustment pixel, the adjustment pixel being one of at least one first candidate surrounding pixel and at least one second candidate surrounding pixel, the at least one first candidate surrounding pixel being positioned in the vector direction, the at least one second candidate surrounding

pixel being positioned in an opposite vector direction opposite to the vector direction, the adjustment pixel having a pixel value closest to the original pixel value of the subject pixel among the at least one first candidate surrounding pixel and the at least one second candidate surrounding pixel; and

a setting unit setting the new pixel value to the subject pixel, thereby obtaining a new image.

2. The image processing device as claimed in claim 1, wherein the multiple pixels are arranged in an x-direction and a y-direction,

wherein the subject pixel is located at a two dimensional location (i, j) that is x-direction and y-direction coordinates of the subject pixel, and

wherein the second calculating unit calculates the new pixel value of the subject pixel based on an equation:

$$g(i, j) = f(i, j) + KT \times (G - f(i, j))$$

where g(i, j) is the new pixel value of the subject pixel, f(i, j) is the original pixel value of the subject pixel, KT is the value determined dependently on the vector magnitude, and G is the pixel value of the adjustment pixel.

3. The image processing device as claimed in claim 2, wherein the value KT has a value satisfying an inequality $0 \leq KT \leq 1$.

4. The image processing device as claimed in claim 3,

wherein the second calculating unit includes:

a comparing unit comparing the vector magnitude with at least one of a first threshold value and a second threshold value that is greater than the first threshold value; and

a KT setting unit setting the value KT to a value of zero (0), when the vector magnitude is less than or equal to the first threshold value, thereby allowing the new pixel value g(i, j) to take a value that is the same as the original pixel value f(i, j), the KT setting unit setting the value KT to a value between zero (0) and one (1), when the vector magnitude is greater than the first threshold value and is less than or equal to the second threshold value, thereby allowing the new pixel value g(i, j) to take a value between the original pixel value f(i, j) and the pixel value of the adjustment pixel G, and the KT setting unit setting the value KT to a value of one (1), when the vector magnitude is greater than the second threshold value, thereby allowing the new pixel value g(i, j) to take a value that is the same as the pixel value of the adjustment pixel G.

5. The image processing device as claimed in claim 1, wherein the first calculating unit performs the differential operation by using a Sobel filter.

6. The image processing device as claimed in claim 1,

wherein the first calculating unit performs the differential operation by using a Prewitt filter.

7. The image processing device as claimed in claim 1, wherein the subject pixel and the surrounding pixels are arranged in an n x n matrix configuration, where n is an odd number that is equal to or greater than three (3).

8. The image processing device as claimed in claim 7, wherein the subject pixel is a central pixel that is positioned at a center of the n x n matrix.

9. The image processing device as claimed in claim 7, wherein the n x n matrix is a 3x3 matrix.

10. The image processing device as claimed in claim 9, wherein the multiple pixels are arranged in an x-direction and y-direction, i and j being respectively x-direction and y-direction coordinates of the subject pixel,

wherein the differential vector has an x-directional component $H(i, j)$ and a y-directional component $V(i, j)$ expressed by equations:

$H(i, j) = -1 \times f(i-1, j-1) -2 \times f(i-1, j) -1 \times f(i-1, j + 1) + f(i+1, j-1) +2 \times f(i+1, j) + f(i+1, j+1)$, and

$V(i, j) = -1 \times f(i-1, j-1) + f(i-1, j+1) -2 \times f(i, j-1) +2 \times f(i, j+1) -1 \times f(i+1, j-1) + f(i+1, j+1)$,

where $f(i-1, j-1)$, $f(i-1, j)$, $f(i-1, j+1)$, $f(i, j-1)$, $f(i, j+1)$, $f(i+1, j-1)$, $f(i+1, j)$, and $f(i+1, j+1)$ are respectively the pixel values of the surrounding pixels that

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are located at two-dimensional locations (i-1, j-1), (i-1, j), (i-1, j+1), (i, j-1), (i, j+1), (i+1, j-1), (i+1, j), and (i+1, j+1),

wherein the vector magnitude of the differential vector is expressed by an equation:

$$gs(i,j) = \sqrt{H(i,j)^2 + V(i,j)^2}$$, and

wherein the vector direction of the differential vector is expressed by an equation:

$$Alfa\_gs(i,j) = \tan^{-1}\left(\frac{V(i,j)}{H(i,j)}\right).$$

11. The image processing device as claimed in claim 7, wherein the n x n matrix is a 5x5 matrix.

12. The image processing device as claimed in claim 1, further comprising an image forming unit forming the new image on a medium.

13. An image processing device for processing an original image including multiple pixels to create a new image, each of the multiple pixels having a pixel value, the device comprising:

an extracting unit extracting, from multiple pixel values of multiple pixels, an original pixel value of a subject pixel and pixel values of surrounding pixels that are positioned to surround the subject pixel, the subject pixel and the surrounding pixels being arranged in a 3x3 matrix configuration;

a first calculating unit calculating a differential vector for the subject pixel by performing a differential operation on the pixel values of the surrounding pixels and calculating a vector magnitude of the differential vector and a vector direction of the differential vector;

a second calculating unit calculating a new pixel value of the subject pixel based on the original pixel value of the subject pixel, a value determined dependently on the vector magnitude, and a pixel value of an adjustment pixel, the adjustment pixel being one of a first candidate surrounding pixel positioned in the vector direction and a second candidate surrounding pixel positioned in an opposite vector direction opposite to the vector direction, the adjustment pixel having a pixel value closer to the original pixel value of the subject pixel than the other candidate surrounding pixel; and

a setting unit setting the new pixel value to the subject pixel, thereby obtaining a new image.

14. An image processing method of processing an original image including multiple pixels to create a new image, each of the multiple pixels having a pixel value, the method comprising:

extracting, from multiple pixel values of multiple pixels, an original pixel value of a subject pixel and pixel values of surrounding pixels that are positioned to surround

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the subject pixel, the subject pixel and the surrounding pixels being arranged in a matrix configuration;

calculating a differential vector for the subject pixel by performing a differential operation on the pixel values of the surrounding pixels and calculating a vector magnitude of the differential vector and a vector direction of the differential vector;

calculating a new pixel value of the subject pixel based on the original pixel value of the subject pixel, a value determined dependently on the vector magnitude, and a pixel value of an adjustment pixel, the adjustment pixel being one of at least one first candidate surrounding pixel and at least one second candidate surrounding pixel, the at least one first candidate surrounding pixel being positioned in the vector direction, the at least one second candidate surrounding pixel being positioned in an opposite vector direction opposite to the vector direction, the adjustment pixel having a pixel value closest to the original pixel value of the subject pixel among the at least one first candidate surrounding pixel and the at least one second candidate surrounding pixel; and

setting the new pixel value to the subject pixel, thereby obtaining a new image.

15. The image processing method as claimed in claim 14, wherein the multiple pixels are arranged in an x-direction

and a y-direction,

wherein the subject pixel is located at a two dimensional location (i, j) that is x-direction and y-direction coordinates of the subject pixel, and

wherein the step of calculating the new pixel value includes calculating the new pixel value of the subject pixel based on an equation:

$$g(i, j) = f(i, j) + KT \times (G - f(i, j))$$

where g(i, j) is the new pixel value of the subject pixel, f(i, j) is the original pixel value of the subject pixel, KT is the value determined dependently on the vector magnitude, and G is the pixel value of the adjustment pixel.

16. The image processing method as claimed in claim 15, wherein the value KT has a value satisfying an inequality $0 \leq KT \leq 1$.

17. The image processing method as claimed in claim 16, wherein the step of calculating the new pixel value includes:

comparing the vector magnitude with at least one of a first threshold value and a second threshold value that is greater than the first threshold value; and

setting the value KT to a value of zero (0), when the vector magnitude is less than or equal to the first threshold value, thereby allowing the new pixel value g(i, j) to take a value that is the same as the original pixel

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value f(i, j), setting the value KT to a value between zero (0) and one (1), when the vector magnitude is greater than the first threshold value and is less than or equal to the second threshold value, thereby allowing the new pixel value g(i, j) to take a value between the original pixel value f(i, j) and the pixel value of the adjustment pixel G, and setting the value KT to a value of one (1), when the vector magnitude is greater than the second threshold value, thereby allowing the new pixel value g(i, j) to take a value that is the same as the pixel value of the adjustment pixel G.

18. The image processing method as claimed in claim 14, wherein the step of calculating the differential vector includes performing the differential operation by using a Sobel filter.

19. The image processing method as claimed in claim 14, wherein the step of calculating the differential vector includes performing the differential operation by using a Prewitt filter.

20. A storage medium for storing a program of processing an original image including multiple pixels to create a new image, each of the multiple pixels having a pixel value, the program comprising the programs of:

extracting, from multiple pixel values of multiple pixels, an original pixel value of a subject pixel and pixel

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values of surrounding pixels that are positioned to surround the subject pixel, the subject pixel and the surrounding pixels being arranged in a matrix configuration;

calculating a differential vector for the subject pixel by performing a differential operation on the pixel values of the surrounding pixels and calculating a vector magnitude of the differential vector and a vector direction of the differential vector;

calculating a new pixel value of the subject pixel based on the original pixel value of the subject pixel, a value determined dependently on the vector magnitude, and a pixel value of an adjustment pixel, the adjustment pixel being one of at least one first candidate surrounding pixel and at least one second candidate surrounding pixel, the at least one first candidate surrounding pixel being positioned in the vector direction, the at least one second candidate surrounding pixel being positioned in an opposite vector direction opposite to the vector direction, the adjustment pixel having a pixel value closest to the original pixel value of the subject pixel among the at least one first candidate surrounding pixel and the at least one second candidate surrounding pixel; and

setting the new pixel value to the subject pixel, thereby obtaining a new image.